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(54) **Cooling beverages**

(57) A remote cooling assembly for finely adjusting the temperature of beverages supplied to a bar along a common insulated pipeline 36, in which the beverage is passed through a product coil in a water filled module 38, 40, 42 adjacent the dispense point, and the temperature of the water in the module is finely adjusted by selectively passing cooling water therethrough from a common cold water line 44 in response to a temperature sensor which detects the temperature of water in the module. The cooling water for the pipeline and the common cold water line may be provided by separate, inter-communicating tanks (Fig 4).

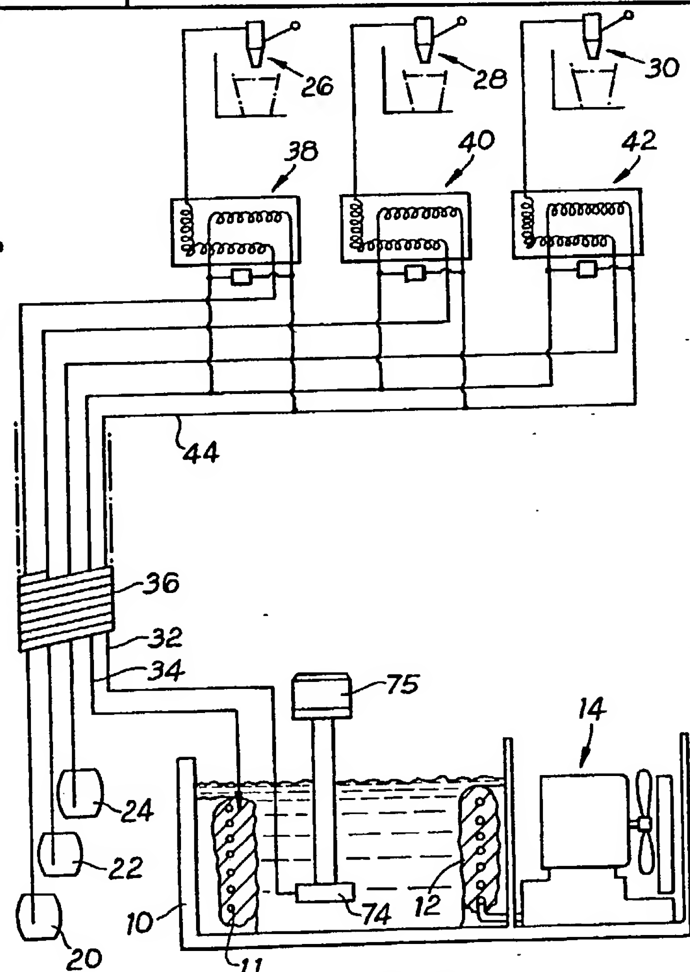

Fig.1

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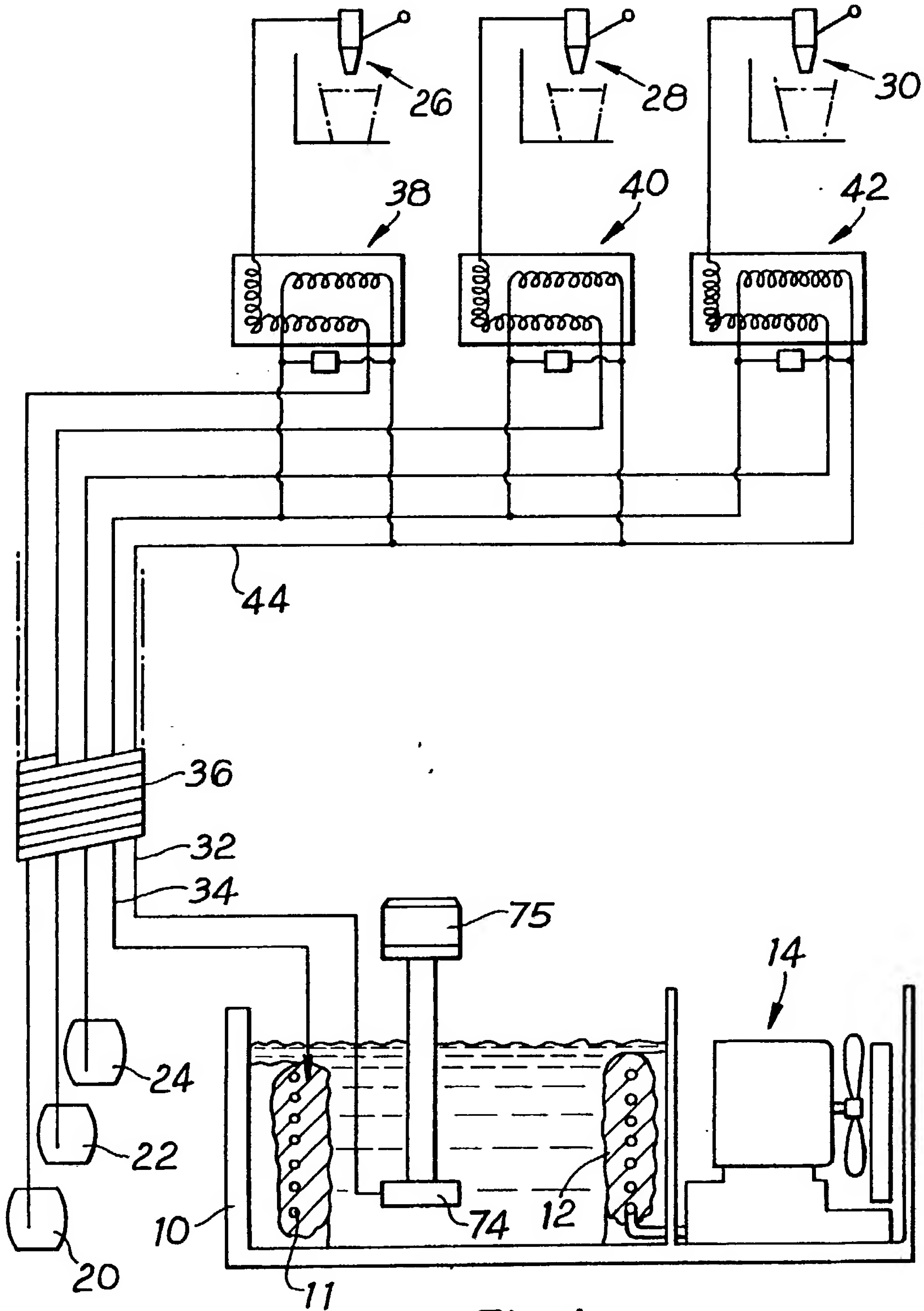

Fig.1

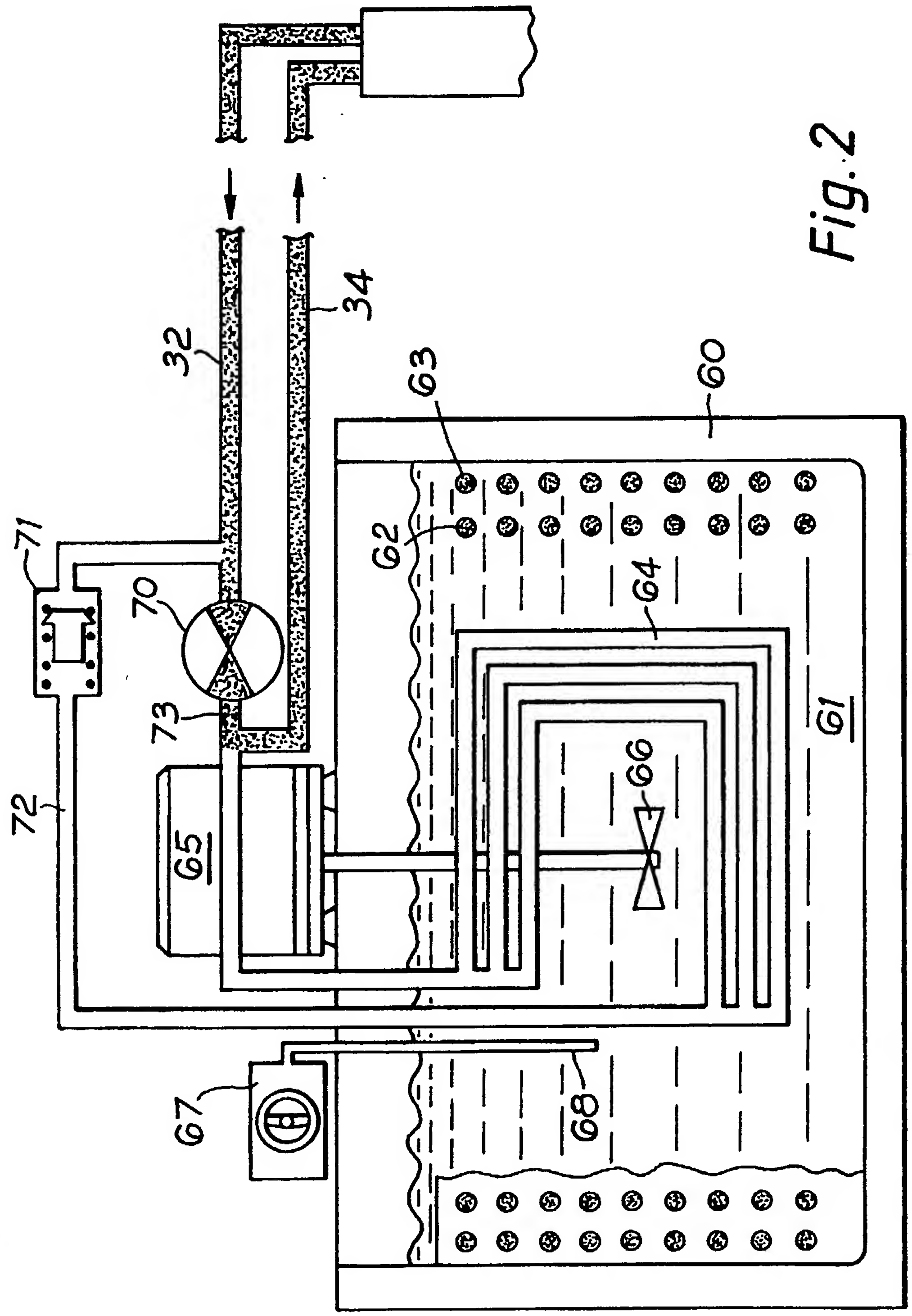

Fig.2

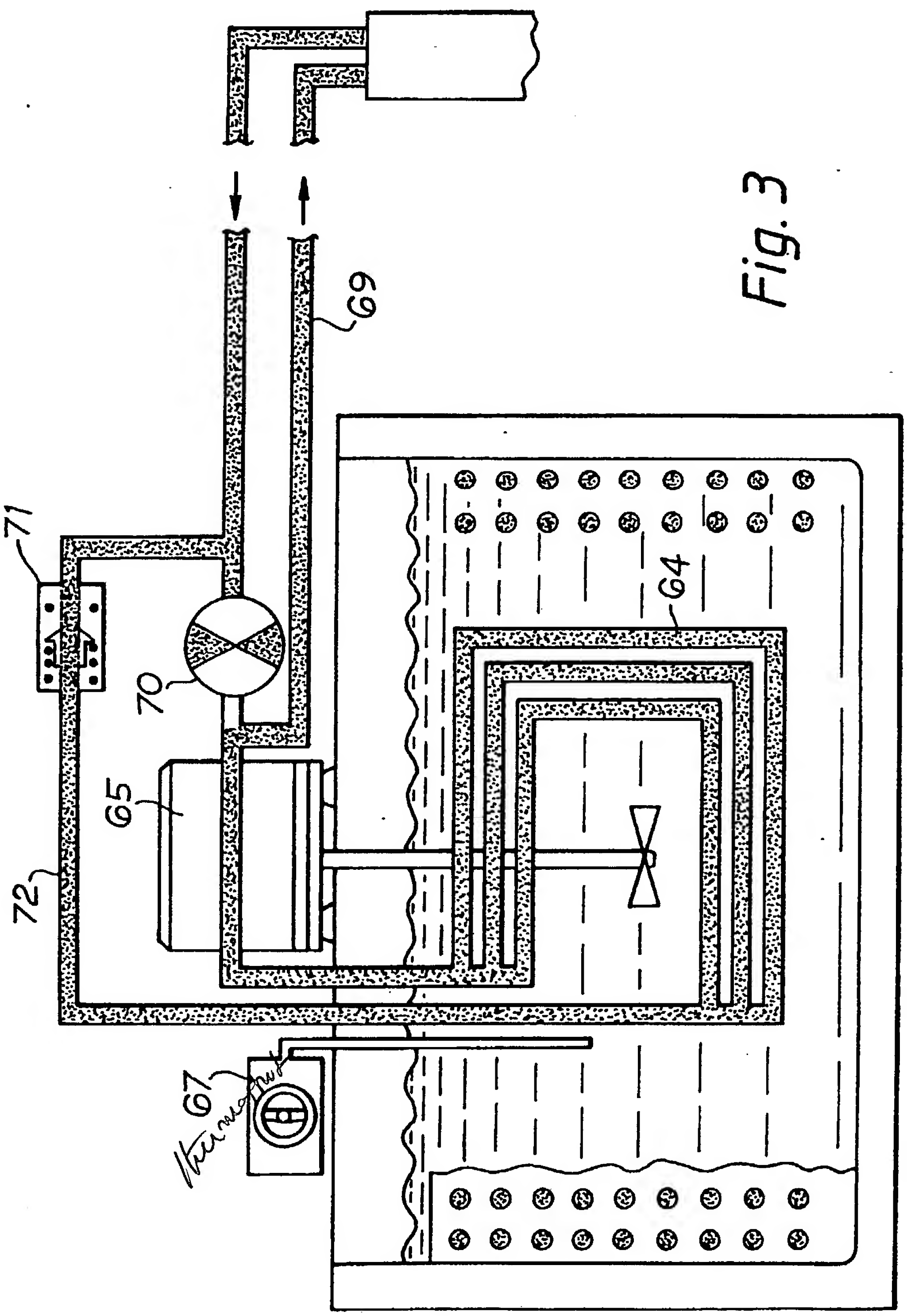

Fig. 3

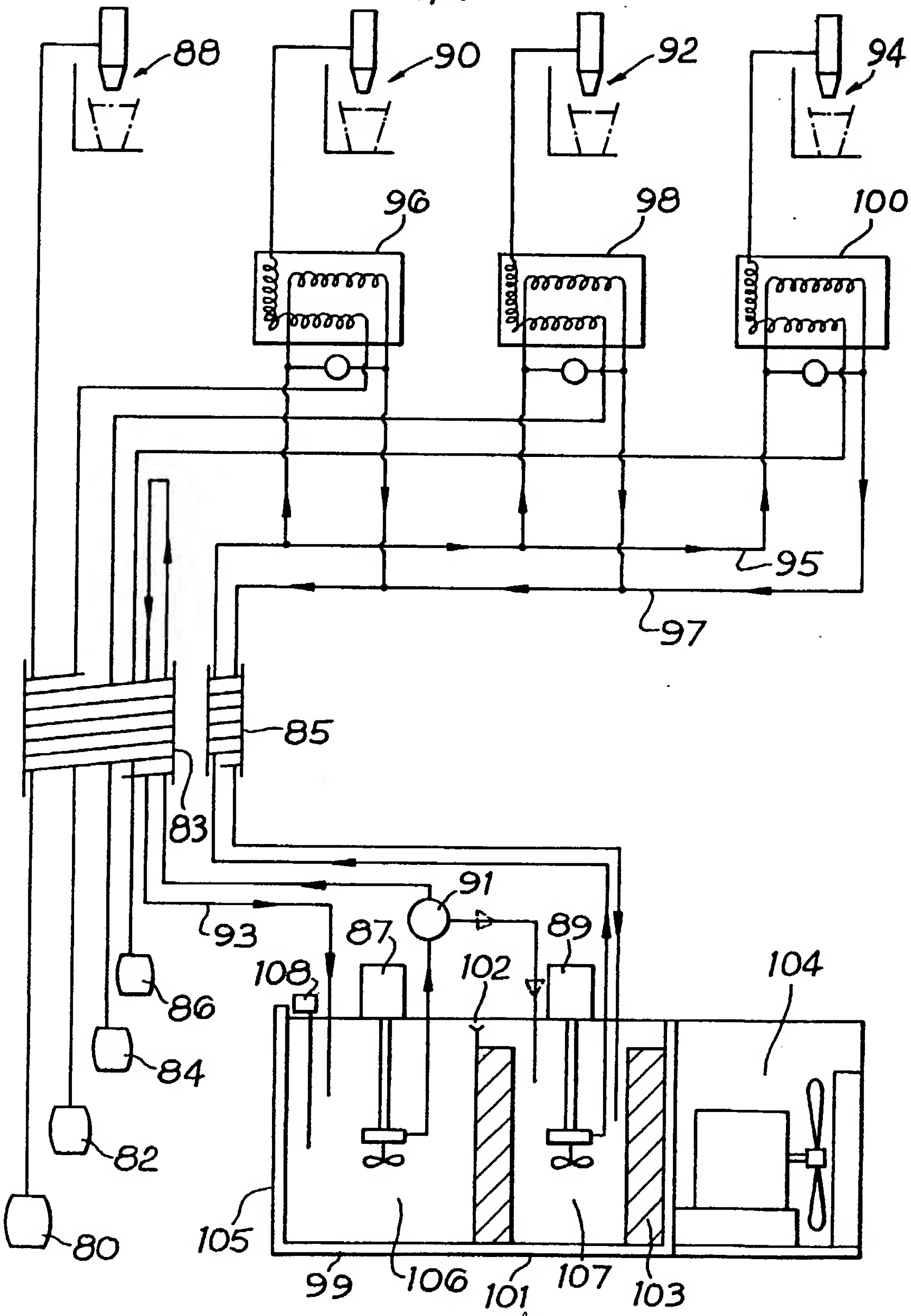
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Fig. 4

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Beverage Dispenser

The invention relates to beverage dispensing and in particular to the dispensing of beverages to be served in accurately controlled temperature condition such as beer and lager.

On licensed premises having a multitude of dispense points, it has been common practice to provide cooling apparatus sited remotely from the serving area. This cooling apparatus typically comprises of a large tank of cold water in which a number of so-called product coils are placed. The water in the bath is maintained at a temperature near to 0 °C by provided an "ice bank" in the tank against which the water is constantly agitated using a stirrer motor. The "ice bank" is formed around an evaporator coil within the tank which forms part of an integral refrigeration system.

A beverage to be served in a cold condition, for example beer or lager, is circulated through one of the product coils in the tank. On exiting the cooler, the beverage temperature must be maintained to the point of dispense which may be several hundred feet away. This is typically attempted by strapping the lines carrying the beverage to a closed loop of pipe through which coolant is pumped from the water bath in the cooler up to the dispense leads and back again. The bundle of pipes are lagged and the arrangement is commonly referred to as a "python".

Cooling systems of this kind have worked reasonably well. However, they do have certain disadvantages. For example, if the sales of a particular beverage are fairly infrequent, the "standstill" or "dwell" time of the beverage in the

python is significant. As a result, the beverage tends to be overchilled (particularly in the case of ales which have a relatively high dispense temperature, typically 12 °C) as the line carrying the beverage from the cooler to the point of dispense is in intimate contact with the line carrying coolant at 1-2 °C (typically) within the python.

A further drawback is that different beverages require cooling to different temperatures. For example, lager is usually required to be served several degrees colder than beer. Beverages remaining in the python for significant periods of time (longer than 15 minuts) tend to equalise out in temperature and drift, in general, to the temperature of the cold recirculating coolant. The result is that previously known systems have never been able to bring several different beverages to their exact ideal temperatures regardless of fluctuations in the levels of collective and individual sales.

According to the invention, there is provided a remote cooling module for cooling beverages including a liquid bath containing a product coil and a cooling coil, means sensitive to liquid temperatures in the bath to control the flow of coolant through the coolant coil and to thereby maintain the liquid in the liquid bath at a predetermined temperature.

The control of flow may be by a divertor valve to divert coolant through a by-pass loop.

The liquid in the bath may be agitated and the liquid may be water.

The cooling coil may be supplied with coolant via an insulated tube containing a plurality of beverage lines.

The coolant may be water or a water/glycol mixture.

The present invention also provides a remote temperature adjustment assembly for beverages comprising:

i) a source of cold coolant,

ii) a tube for connecting the source to a remote temperature adjustment module,

iii) the remote temperature adjustment module including

a) a liquid bath

b) a coolant coil in the liquid bath

c) a product coil in the liquid bath

d) a temperature sensor responsive to the temperature of liquid in the liquid bath

e) means responsive to the temperature sensor to control the flow of coolant through the coolant coil to maintain the temperature of the liquid bath within a predetermined temperature range.

The means responsive to the temperature sensor may comprise a divertor valve adapted to by-pass the coolant coil when the temperature of the liquid in the liquid bath is below a predetermined level.

The tube may be insulated and beverage lines may be located in the insulation surrounding the coolant tube.

A plurality of remote temperature adjustment modules may be connected at the same source of coolant. The plurality of remote temperature adjustment modules may be connected in parallel.

The liquid in the bath may be agitated.

The coolant may be water or a water/glycol mixture.

The present invention thus overcomes the problems of the prior art by trimming each individual beverage to its ideal temperature at the point of dispense itself. A part of the invention termed the "controlled temperature module", consists of an insulated liquid bath containing a cooling coil, a product coil or coils, and means sensitive to liquid temperatures in the bath to divert the flow of coolant through the cooling coil and to thereby maintain the liquid in the liquid bath at a pre-determined temperature.

The means to divert the main stream of coolant through the cooling coil of a particular module will be by way of a divertor valve. The liquid in the bath is continuously agitated both for good heat exchange between the product coil(s) and the liquid and for even temperature distribution within the liquid itself. The liquid may be agitated using an electric motor and paddle arrangement or by using the coolant flow itself to drive an agitator propellor directly.

Coolant for the modules can be supplied in two ways.

In existing installations where remote coolers and pythons are already installed, modules can be spliced in to the system at the point of dispense for a particular beverage to improve the control of its dispense temperature. In this case, the coolant is the existing water recirculating supply in the python. The major advantage of this type of installation is that of low cost. There are, however, disadvantages. Firstly, the number of modules that can be spliced in to any one system is limited by the

capacity of the pump supplying the existing water recirculating facility (typically, this would limit the installation to a maximum of two or three modules). Secondly, the temperature of the coolant may well be quite high (4 or 5 °C) due to the heat it picks up from product lines within the python. This, of course, limits the cooling capacity of the modules.

For new installations, the second part of the invention calls for a large remote cooler housing two adjacently sited insulated tanks each with their own recirculating pumps. The first bath contains an ice bank reserve (produced by an integral refrigeration unit adjacent to the tank) grown around the inside of the tank surrounding a central pool of cold liquid in which the recirculating pump is positioned. The second tank contains the same liquid but at a pre-selected temperature somewhat higher than that in the first tank, also with its own recirculating pump. Also provided is a means to divert liquid from the second tank to the first tank in order to displace cold liquid from the first tank over a weir into the second tank in response to a rise in temperature of the liquid in the second tank.

The pump in the first tank is used to supply a high volume flow of liquid coolant around an insulated closed loop or ring main circuit for use with the aforementioned controlled temperature modules disposed at various points within the serving area. The pump in the second tank is used to supply a smaller volume of liquid coolant at a specified temperature for use in a python system carrying beverages from the cellar to the point of dispense. By setting the temperature of this coolant near to the desired dispense temperature, overchilling of the beverage during long

standstill periods within the python can be avoided. In this way, all beverages can be taken up to the serving area at the highest common dispense temperature. All beverages requiring further cooling can be 'trimmed' using the controlled temperature modules working off the ring main of very cold coolant. The second pump is also used, in conjunction with a divertor valve, as a means of transferring liquid from the second tank to the first in a manner described above when the temperature of the liquid in the second tank rises above the desired setting.

The liquid used can be water but would preferably be a water/glycol solution. In this way, the temperature of the coolant used in the ring main circuit can be dropped below 0 °C, so increasing the resulting capacity of the controlled temperaure modules for a given flow rate of coolant.

In order that the invention may be fully understood and readily carried into effect, the same will now be described, by way of example only, with reference to the accompanying drawings, of which

FIGURE 1 is a schematic illustration of a typical existing remote system embodying a controlled temperature module aspect of the invention in retrofit form.

FIGURE 2 is an enlarged view of the controlled temperature module of Figure 1 in one condition,

FIGURE 3 is a view similar to Figure 2 with the controlled temperature module in an alternative condition, and

FIGURE 4 is a schematic illustration of the complete invention, using the

controlled temperature module with the new remote cooling system.

Referring now to Figure 1, the cooling system there illustrated includes a cooler constituted by a cold water tank 10 through which a refrigerant is circulated through an evaporator coil 11 wound around the inside walls of the tank, so forming an "ice bank" 12. the refrigeration system supplying the refrigerant is generally shown at 14.

The cooling system is associated in the illustrated example, with beverage dispensing apparatus for dispensing three different beverages contained in respective kegs or barrels 20, 22 and 24 in a cellar. The beverages can be dispensed through respective taps 26, 28 and 30 in a bar (or in respective bars). The arrangement can be such that when one of the dispense taps is opened, a drop in pressure in the respective delivery line causes the closure of a pressure switch (not shown) and this in turn activates a respective electric motor driven pump (not shown) which raises the beer or lager concerned from the keg or barrel. Alternatively, beverage may be dispensed using a hand operated linear displacement pump or 'hand pull'.

To prevent a large rise in temperature of the beer or lager from the keg to the dispense point, a run of each supply conduit is maintained in close thermal contact with flow and return lengths 32 and 34 of the cold water recirculation pipes from the cooler, the bundle of pipes having been lagged together as indicated at 36 using sponge or synthetic rubber sleeving (or similar). The bundle of pipes is referred to generally as a python.

To adjust the temperature of the beverages to the individual temperatures at which they should be served, there are provided respective controlled temperature modules 38, 40 and 42 associated with the beverages 26, 28 and 30 respectively. Each module is connected to the flow and return pipes of the water recirculation ring main shown generally at 44.

The controlled temperature modules such as 38, 40 and 42 are shown in more detail in Figures 2 and 3.

Referring to Figure 2, this shows a water-tight insulated container 60 in which there is located a volume of water 61. A pair of product coils 62, 63 are immersed within the water 61. A cooling coil 64 is also immersed within the water and is divided into three streams to reduce the pressure drop through it for a given flow of coolant. An agitator motor 65 is mounted on the top of the tank 60 and drives an agitator propeller 66. A thermostat 67 has a probe 68 within the water to monitor the temperature of the water.

The cooling coil 64 is connected to the cold water recirculating flow line 32 and return line 34. A divertor valve 70 is used to allow the coolant to by-pass the cooling coil 64 when operating in the mode as shown. A pressure relief valve 71 is fitted into the line 72 leading from supply line 32 to the cooling coil 64. Normally the water in container will remain in the liquid state, but if water/glycol mixtures are passed through the coolant coil some freezing of the water in the container might be possible.

The beer passing from the beer source 20 along the python 36 to the dispense tap 26 passes through the product coil 62 or 63. Coil 62 may be connected to one source of beer and coil 63 may be connected to

a second source of beer provided the desired dispense temperature setting is the same in each case. Alternatively, beer may pass sequentially through both coils for even finer control of dispense temperature.

The controlled temperature module 60 is located in the bar area close to the dispense point 26. As beer is passed through the module, the water 61 in the tank 60 warms up. When the water temperature rises above a preselected level, the thermostat 67 senses this and causes the divertor valve 70 to close so causing the cold recirculating water in the supply line 32 to open the pressure relief valve 71 and pass through the cooling coil 64 before returning to the return line of the coolant loop 34 as shown in Figure 3. The temperature of the coolant passing through the cooling coil 64 is significantly less than the temperature of the water 61 in the bath. The constantly running agitator paddle 66 washes the water 61 vigorously over the cooling coil 64, so transferring heat from the water to the coolant and, therefore, bringing down the temperature of the water in the bath. The rate at which the temperature of the water in the water bath is reduced is dependant upon the temperature difference between the water in the bath and the coolant as well as the flow rate of the coolant. Cooling of the water continues until the thermostat 67 detects a minimum pre-set value whereupon the divertor valve 70 opens again, allowing the coolant to once again by-pass the cooling coil as shown in Figure 2.

In controlling the temperature of the water reservoir 61 within closely defined limits and immersing product coils 62, 63 of considerable length within this reservoir and constantly agitating the

water 61 over the product coils, the temperature of the beverage passing through the product coils can be very accurately controlled at a temperature close to or at that of the water reservoir. In positioning the module 60, close to the dispense point 26, this controlled temperature is maintained to the dispense point. The temperature of the water reservoir 61, and therefore the beverage, can be altered simply by adjustment of the thermostat 67.

It can be appreciated, therefore, that the systems of the present invention will permit not only cooling of a number of different products running in a common python to a number of different desired temperature settings, but will also warm any particular product which has been cooled excessively within the python to its desired temperature setting.

Each cooling module is relatively small and compact so that it can be conveniently disposed in the bar area, for example beneath the dispense tap which it serves. It may be possible to incorporate the module as an integral part of the dispense tap itself.

Referring now to Figure 4, this illustrates the two major aspects of the invention as it pertains to a new installation. The invention comprises a large cooler 105 sited remotely from the serving area; a product python 83 carrying beverage lines and a controlled temperature coolant recirculating loop 93, a number of controlled temperature modules 96, 98, 100 supplied by a cold coolant ring main 85, with flow and return lines 95, 97; and dispense points 88, 90, 92, 94.

The remote cooler 105 comprises a refrigeration system, shown generally at 104; an ice bank 101 containing the evaporator to build the ice

bank 103 and liquid coolant 107; and a controlled temperature liquid tank 99 containing liquid coolant 106 and thermostat 108. Each tank contains its own recirculating pump 87, 89.

In operation, the pump 87 supplies a continuous flow of liquid coolant 93 at a controlled temperature to the python 83. All beverage lines run through this python and are in close thermal contact with the liquid coolant line 93. The temperature of the liquid coolant is set to a temperature so as to maintain all beverages within the python at a prescribed temperature normally that of the highest required dispense temperature for a particular beverage. Beverages to be dispensed at this temperature, in this case 80, can then be dispensed directly 88 without the need for further temperature adjustment. Typically the temperature of the coolant in the line 93 would not be too dissimilar to the required dispense temperature of the beverage 88, thereby ensuring close control of dispense temperature and eliminating any propensity to overchill. The effect of product load and the work done by the pump 87 on the coolant 106 will cause the temperature of the coolant to rise. A rise beyond the set limit is detected by the thermostat 108 which then activates the divertor valve 91, so diverting the coolant flow from the recirculating line 93 into the ice bank bath 107. Cold coolant 107 is then displaced and flows over the wier 102 into the bath 99, so reducing the temperature of the coolant reserve 106. Once the coolant 106 falls to a predetermined temperature, sensor 108 activates the divertor valve 91, so restoring flow to the recirculating loop 93.

Other beverages 82, 84, 86 may require cooling to a lower temperature. In this case, beverages are passed through controlled temperature modules 96, 98, 100 in a way described earlier on in this application, to be dispensed at 90, 92 and 94 respectively. The controlled temperature modules are supplied from a ring main 85 of cold coolant 107 supplied by the pump 89 from the tank 101. The liquid coolant used may be a water/glycol solution in order that the coolant 107 can be maintained at a very low temperature (preferably below 0 °C). In this way, the cooling capacity of the system is increased.

Thus, it will be understood that there is provided a cooling system for use with beverage dispensing points that either in part, for use with existing installations, or in full, for new installations, a plurality of different beverages can be dispensed at a number of different dispense temperatures all within very close, pre-determined temperature limits. The system is insensitive to changes in variables which often affect current systems and, therefore, ensures accurate dispense temperatures under all conditions. Such variables include the quality of the python construction, liquid coolant temperature and flow rate, length of python, ambient temperature, product inlet temperature and, most importantly, dispense pattern. A further advantage of the system is that dispense temperature of any particular beverage can be altered with ease, simply by adjustment of a thermostat. Addition of a new beverage to an outlet is also made easier in that a small, inexpensive temperature controlled module can be added to the system, instead of a new cooler, with the additional benefit of guaranteed dispense

temperature regardless of product inlet temperature, dispense rate or drink size.

CLAIMS:

1. A remote cooling module for cooling beverages including a liquid bath containing a product coil and a cooling coil, means sensitive to liquid temperatures in the bath to control the flow of coolant through the coolant coil and to thereby maintain the liquid in the liquid bath at a predetermined temperature.

2. A remote cooling module as claimed in Claim 1 in which flow is controlled by a diverter valve to divert coolant through a by-pass loop.

3. A remote cooling module as claimed in Claim 1 or 2 in which the liquid in the bath is agitated.

4. A remote cooling module as claimed in any one of Claims 1 to 3 in which the liquid in the bath is water.

5. A remote cooling module as claimed in any one of Claims 1 to 4 in which the cooling coil is supplied with coolant via an insulated tube containing a plurality of beverage lines.

6. A remote cooling module as claimed in any one of Claims 1 to 5 in which the coolant is water or a water/glycol mixture.

7. A remote temperature adjustment assembly for beverages comprising:

i) a source of cold coolant,

ii) a tube for connecting the source to a remote temperature adjustment module,

iii) the remote temperature adjustment module including

a) a liquid bath

b) a coolant coil in the liquid bath

c) a product coil in the liquid bath

d) a temperature sensor responsive to the temperature of liquid in the liquid bath

e) means responsive to the temperature sensor to control the flow of coolant through the coolant coil to maintain the temperature of the liquid bath within a predetermined temperature range.

8. An assembly as claimed in Claim 7 in which the means responsive to the temperature sensor comprises a diverter valve adapted to by-pass the coolant coil when the temperature of the liquid in the liquid bath is below a predetermined level.

9. An assembly as claimed in Claim 7 or 8 in which the tube is insulated and beverage lines are located in the insulation surrounding the coolant tube.

10. An assembly as claimed in any one of Claims 7 to 9 in which a plurality of remote temperature adjustment modules are connected to the same source of coolant.

11. An assembly as claimed in Claim 10 in which the plurality of remote temperature adjustment modules are connected in parallel.

12. An assembly as claimed in any one of Claims 7 to 11 in which the liquid in the bath is agitated.

13. An assembly as claimed in any one of Claims 7 to 12 in which the coolant is water or a water/glycol mixture.

14. A module as claimed in Claim 3 or an assembly as claimed in Claim 12 in which the liquid is agitated by means of an electric motor and paddle assembly or by an agitator driven by the coolant flow.

15. An assembly as claimed in any one of Claims 7 to 14 in which the source of coolant is a remote cooler housing containing two adjacently sited insulated tanks each having an associated recirculating pump.

16. An assembly as claimed in Claim 15 in which the first tank contains an ice bank reserve and the second tank contains the same liquid at a preselected higher temperature than the first tank, there being provided means to divert liquid from the second tank to the first tank so as to displace colder liquid from the first tank to the second in response to a rise in temperature in the second tank.

17. An assembly as claimed in Claim 16 in which liquid flows from the first tank over a weir into the second tank.

18. An assembly as claimed in any one of Claims 15 to 17 in which liquid is pumped from the first tank around an insulated closed loop to the remote modules.

19. An assembly as claimed in Claim 18 in which liquid from the second tank is circulated through the insulated tube to cool the beverages in liner in the insulated tube.

20. An assembly as claimed in Claim 18 in which there is provided a diverter valve to divert liquid pumped from the first tank into the second tank rather than or in addition to pumping the coolant liquid through the insulated tube.

21. An assembly as claimed in any one of Claims 15 to 20 when appended to Claim 14 in which the liquid in the first and second tanks is water or a water/glycol solution.

22. A remote cooling module substantially as herein described with reference to and as illustrated

by Figure 1 or Figures 2 and 3 or Figure 4 of the accompanying drawings.

23. A remote temperature adjustment assembly for beverages substantially as herein described with reference to and as illustrated by Figure 1 or Figures 2 and 3 or Figure 4 of the accompanying drawings.

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